APPENDIX D

Biological Survey Report for the Santa Maria Creek Restoration Project: riparian birds (Lovio 2007)

Biological Survey Report for the Santa Maria Creek Restoration Project:

Riparian Birds

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Introduction

Santa Maria Creek traverses the Ramona Grasslands Project (RGP) in an east to west direction for a length of approximately 4.5 miles (7.25 km). A riparian bird census was conducted in the spring and summer months of 2005 for a selected area along the length of Santa Maria Creek within the Ramona Grasslands/Santa Maria Restoration Project study area and riparian habitats associated with the creek. This bird study provides a baseline dataset for future monitoring of the RGP.

Project Location

Surveys were conducted within a core preserve area known as the Ramona Grasslands Preserve (RGP). RGP is located in the vicinity of the Santa Maria Creek and the Ramona Airport in the western portion of the community of Ramona, San Diego County, California (Figure 1). The preserve area includes properties currently owned by The Nature Conservancy, including the former Cagney Ranch, the Hardy property, Oak Country Estates, and Eagle Ranch. Adjacent landowners, including Wildlife Research Institute (WRI), selected Voorhes Lane properties, Cumming Ranch, the County's Ramona Airport open space, Hobbs, Martz, and the Ramona Water District were given the opportunity to take part in this project. Only properties with landowner consent were included in project activities.

Most of the properties have been used as livestock pasturage, but were formerly part of a large expanse of native grassland. These locations have been identified by the proposed North County Multiple Species Conservation Program (MSCP) Subarea Plan as areas of very high quality habitat and, as such, have been included in the planned preserve area.

Project Description

The County of San Diego Department of Parks and Recreation was awarded a Proposition 13 Grant by the California Water Resources Control Board for the Santa Maria Creek Protection and Restoration Project. The purpose of the grant is to protect and restore Santa Maria Creek and its adjacent watershed areas within the Ramona Grasslands Preserve, the project area, (hereinafter referred to as "Ramona Grasslands"), to improve water quality and habitat conditions in the creek corridor. Santa Maria Creek has been subjected to unmanaged cattle grazing, which has resulted in elevated suspended sediment concentrations, bacteria, and nutrients in the stream. In addition, increasing urbanization in the town of Ramona, upstream of the project area, has contributed urban, non-point source runoff to the stream. Land uses upstream of the Ramona Grasslands are largely rural residential, but development densities are projected to increase in the future according to General Plan 2020 of the County of San Diego. The Santa Maria Creek Protection and Restoration Project will prevent residential development in the Ramona Grasslands, thus eliminating a future source of urban runoff to Santa Maria Creek and downstream receiving waters.

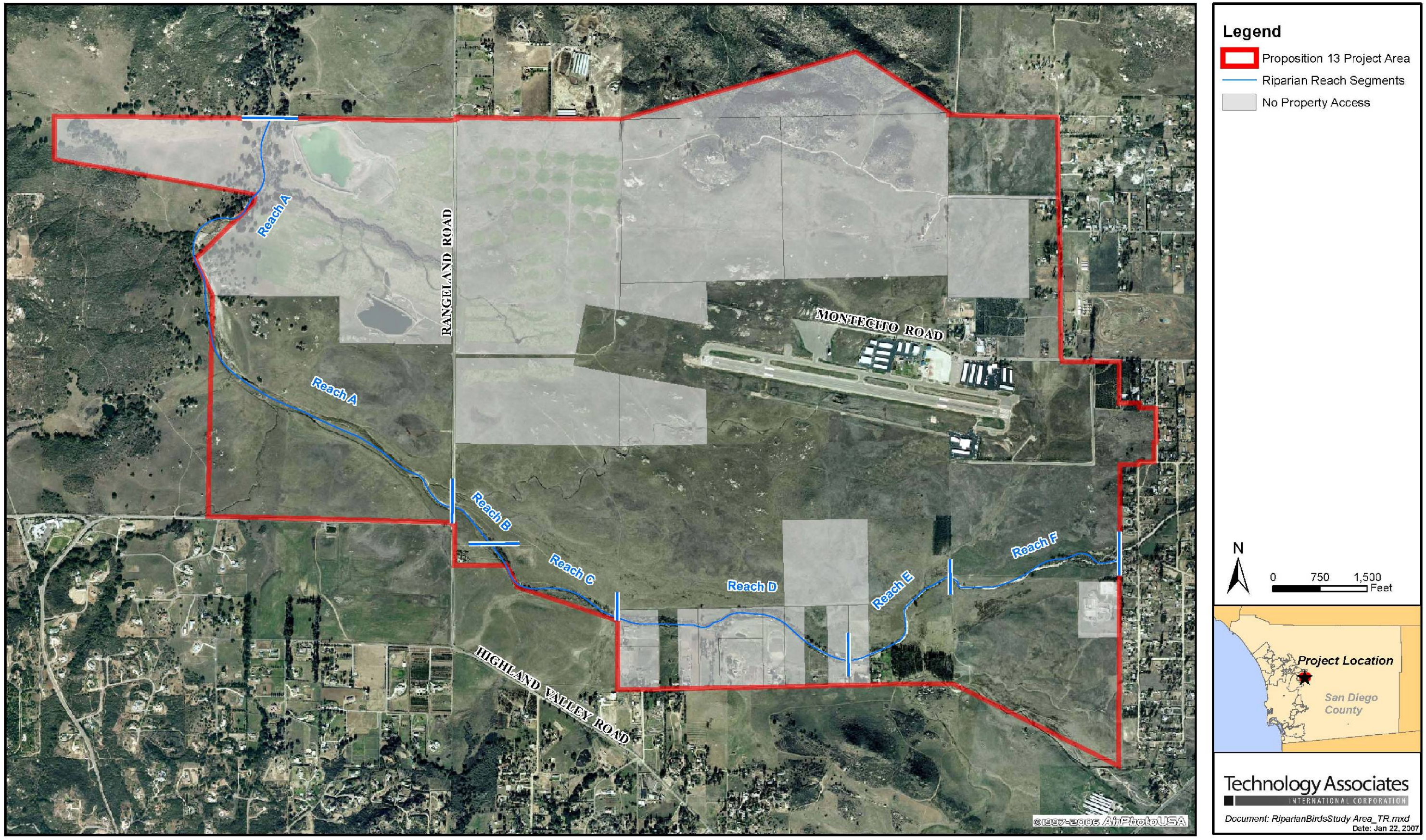

Figure 1: Santa Maria Creek Riparian Birds Study Area

The project will also manage cattle grazing by limiting access of livestock to the creek corridor with fencing, thus eliminating a source of agricultural pollutants and allowing stabilization of the channel and restoration of riparian and wetland vegetation to enhance riverine functions in the creek system.

A second component of the project consists of collecting baseline biological data, which will facilitate preserve management decision-making and track responses to management actions to refine recommended monitoring protocols. Baseline data will enable preserve managers to:

- Measure the success of the non-native plant species removal and restoration program.
- Measure changes in the physical condition and hydrology of the creek, ephemeral aquatic habitats (vernal pools, vernal swale, and alkali playas) and their watersheds.
- Track changes in the current distribution and abundance of management target species.
- Understand the distribution of non-native animal species.
- Provide a benchmark to which all subsequent monitoring data can be compared, realizing that the "typical" and historic conditions of the Grasslands are unknown.

The conservation target species selected for the baseline surveys are the arroyo toad (*Bufo californicus*), riparian bird species, raptors, and Stephens' kangaroo rat (*Dipodomys stephensi*). In addition, vernal pools were also examined for invertebrates, reptiles and amphibians, and plant species. Grassland floral surveys and vegetation transects across Santa Maria Creek were also performed. Monitoring the distribution, relative abundance, and species richness of the plant and animal communities, including reptiles, amphibians, birds and raptors, over time will provide insight about the ecological integrity of the riparian and grassland communities. Observations of non-native species, such as the brown-headed cowbird (*Molothrus ater*) which is a brood parasite for many native bird species, will also serve as an important indicator of ecological health.

The following sections describe the methods and results of the baseline riparian bird surveys that were conducted by ornithologist John Lovio in the spring and early summer of 2005 on behalf of TAIC. The significance of these results and recommendations for future monitoring will be discussed as well.

Methods

A breeding-bird census (Van Velzen 1972) was conducted on 3.4 miles (5.4 km) of Santa Maria Creek, from the western edge of residential development in Ramona (just west of Sawday Street) westward to the property line approximately 0.9 creek miles (1.4 km) west of Rangeland Road. Parcels for which no survey access was provided were assessed from neighboring parcels that were access authorized (Figure 1).

The breeding-bird census, which utilizes the technique commonly known as "spot-mapping" (Bibby et al. 1992, Ralph et al. 1993), is intended to not be a form of sampling, but rather a complete census of all birds breeding in a specific area. Under the assumption that pairs of breeding birds occupy regular areas that are at least partially exclusive of other pairs of the same species during the breeding season and that territorial birds advertise their presence by visual and auditory clues, census areas are completely and systematically surveyed on each of multiple visits during a single breeding season. During each census visit, the locations and behaviors of all individuals of all species detected are recorded on a map of the census area. Map registrations from each visit for a given species are transferred to a summary map that displays the cumulative point locations and associated data. Over repeated visits, the cumulative map registrations for each species tend to form distinct clusters that represent different pairs (or other breeding units, as discussed below) of a given species. Summary maps are interpreted by the observer as the different pairs of a species by means of spatial clustering of map registrations, aided by associated field data on demographics, simultaneous observations of adjacent advertising males, nest locations, and knowledge of the ecology of each species. Clusters representing distinct pairs are typically enclosed in hand-drawn polygons, which generally reflect breeding territory cores rather than comprehensive maps of breeding territories or home ranges. The spot-mapping method provides the advantages of a direct measure of abundance and density for each species and, when superimposed on an aerial photograph or vegetation map, a direct measure of distribution of each species with respect to areas of different habitats.

The Santa Maria Creek bird census area consisted of all riparian habitat on the creek between the endpoints described above. This represents about 52 acres of habitat, ranging from narrow sections (30 ft. / 10m) of unvegetated sandy channel to broad sections (220 ft. / 67 m) of mature willow-cottonwood forest. The census reach comprised three basic types of bird habitat: 1) riparian forest ranging from low and open to tall and dense, with or without undergrowth, and dominated by willows (*Salix* spp.) and cottonwoods (*Populus fremontii*); 2) riparian scrub dominated by mulefat (*Baccharis salicifolia*) and/or small willows; and 3) open channel/floodplain with either bare sand or low herbaceous growth (Figure 1). Locations of each of these types is a result of historic land uses and hydrology. Although the distribution of the basic habitat types is complex on a small scale, approximately the western third of the reach is dominated by riparian scrub, the middle third by riparian forest, and the eastern third by a mixture of open channel and disturbed forest.

The bird census was conducted uniformly along the entire study reach, irrespective of habitat types and political boundaries. However, in the locational data analysis, map registrations and breeding territory cores (clusters) were recorded as occurring within any of six land use – habitat segments that correspond to property boundaries (Figure 1 and Table 1). Habitat within each of these segments is fairly uniform as a result of natural and anthropogenic factors and, with the exception of one, the lengths of the segments are roughly comparable (Table 1). The delineation of these segments and the categorization of bird data within them will provide for simultaneous avifaunal comparisons among the habitat types.

Table 1. Characteristics of six land use – habitat segments along Santa Maria Creek (see Figure 1).

Segment	Length (mi)	Area (acres)	Predominant Habitat	Proportion Vegetated
A			Riparian scrub, wet herbaceous	
B			Riparian scrub, wet herbaceous	
C			Open / disturbed willow woodland	
D			Mature willow-cottonwood forest	
E			Open channel with scattered willows	
F			Disturbed willow-cottonwood forest, open channel	

The 2005 Santa Maria Creek breeding-bird census was conducted on seven dates over a period of 37 days between mid-May and mid-June. Table 2 provides a summary of daily field effort and conditions during the census period.

Table 2. Santa Maria Creek 2005 Breeding-Bird Census Effort and Conditions.

Date	Start Time	End Time	Census Duration (hours)	Weather
5-12	07:00	17:00	8.8*	45° to 80° F, clear, wind 0 to 5-10 mph, W
5-20	06:40	14:10	7.5	53° to 90° F, clear, wind 0 to 5-8 mph, W
5-27	06:40	14:50	7.5*	53° to 79° F, low fog to clear, wind 0 to 5-8 mph, SW
6-2	06:10	15:40	8.8*	57° to 65° F, overcast, wind variable, 0 to 3 mph, W
6-6	06:30	15:30	7.8*	57° to 74° F, variable clouds (80-10%), wind 5-15 mph, W
6-10	06:10	14:20	8.2	60° to 70° F, overcast to 10% clouds, wind 0-8 mph, W
6-17	06:30	14:10	7.7	54° to 76° F, variable clouds (80-10%), wind 2-10 mph, W

* Discrepancies between duration and range of hours is attributable to non-census transit time within the census.

Daily census visits were begun shortly after dawn to maximize the use of higher morning bird activity. Starting points on the creek and directions of movement were varied among the census visits, such that each section of the creek was covered at various times of day throughout the census period in an effort to minimize bias from differences in bird activity attributable to time of day. Bird locations for all species were marked on a separate high-resolution aerial photograph for each visit and associated demographic and

behavioral data were recorded on a standard data form (Appendix A). Such information associated with map points serves to facilitate the subsequent interpretation of the cumulative clusters or scatters of map registrations for each species. Conditions or behaviors that convey important information in terms of distinguishing adjacent breeding units of a given species include song or other territorial displays of males (or females of some species), male-female pairs, simultaneous observations of different displaying birds or pairs, relatively large movements of individual birds, nesting behavior such as carrying of material or food or presence of actual nests, and the presence of juvenile birds.

Interpretation of summary maps for the various species involved two somewhat overlapping steps: 1) Initial recognition of map clusters that likely represent separate breeding pairs or other units of the species. This step employed several basic criteria for qualifying any group of map registrations as a potential breeding unit of a species: a) Some level of obvious clustering of registrations relative to the overall dispersion of registrations for the species throughout the study area; criteria for clustering accounted for the scale of movement (generally the reciprocal of density) of the particular species; b) inclusion of registrations from a minimum of three dates spanning at least two weeks (approximately half of the 37-day span of the census period); c) presence of a nest or other definitive evidence of nesting if criteria a or b were lacking or insufficient. 2) Separation of clusters from adjacent clusters of the same species. Clues involved in this process included: a) gaps between clusters in otherwise continuous habitat; b) simultaneous or nearly simultaneous territorial displays by adjacent pairs; c) counterpart territorial registrations close in time in each cluster on one or more dates (greater confidence of distinctness of clusters with more dates).

The details of species summary map interpretation are discussed in Bibby et al. (1992).

Results and Discussion

The Santa Maria Creek Breeding Avifauna

Fifty-five bird species were recorded within the riparian census zone (Figure 2), as defined above. The list of species, their local status, daily total individual counts, and associated statistics are presented in Table 3. The daily counts provide a measure of the frequency of occurrence (or detection) of a given species on the creek and an index of the total breeding density, as discussed below.

Thirty-one of these species were documented or assumed breeding species within the riparian habitat and/or its immediate vicinity. Twenty species are regarded as “visitors”, which are defined as species nesting in adjacent areas of similar or dissimilar habitat that make occasional use of the study area, but exhibit no consistent presence (Van Velzen 1972). Four species were transient neotropical migrants moving from southern wintering grounds to northern breeding grounds.

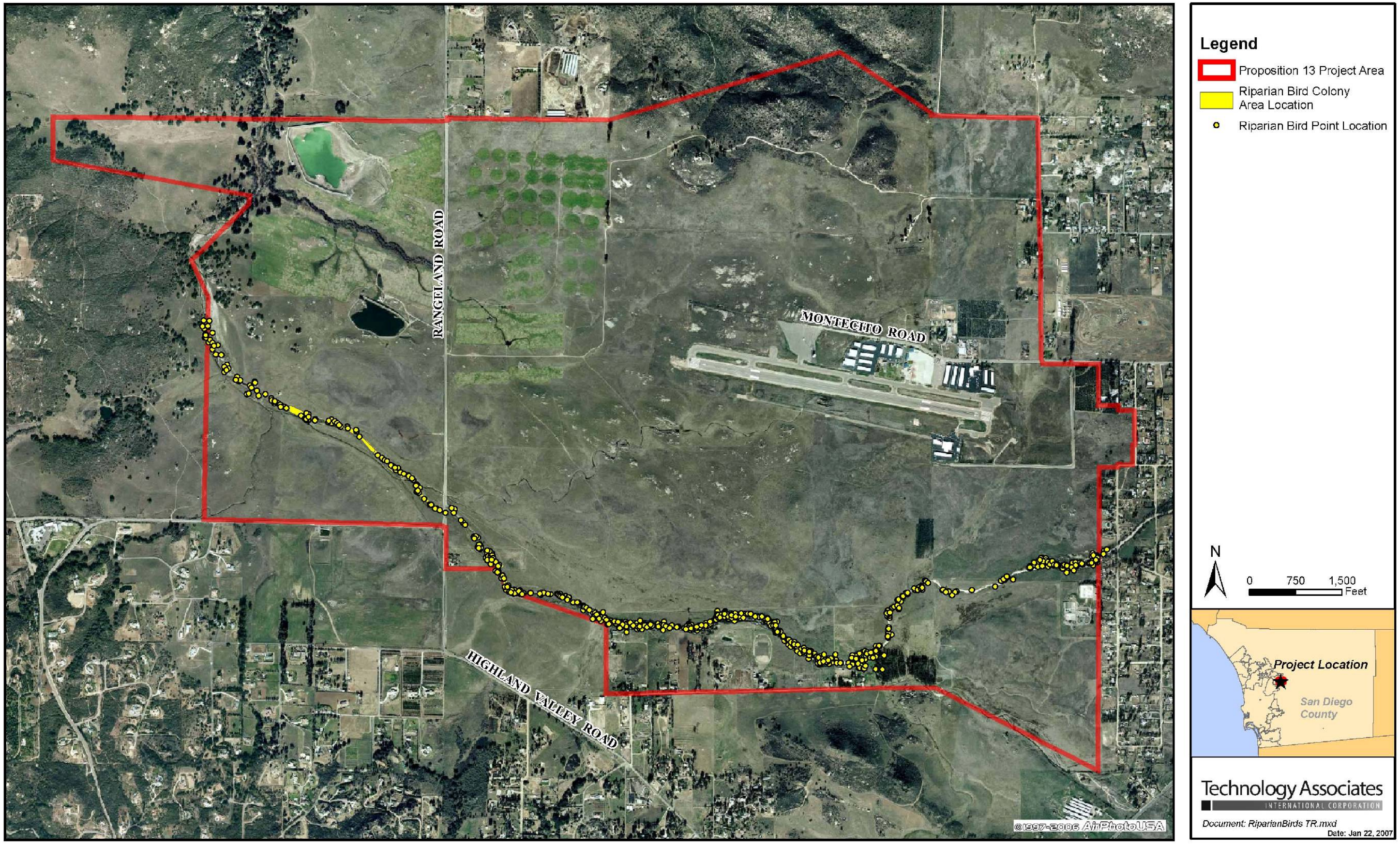

Figure 2: Locations of the Total Number of Breeding Birds Observed in the Study Area

Table 3. Santa Maria Creek 2005 breeding-bird census: species list and daily individual count summary.

Species				Date (Map Code)									
Common	Scientific	Data Code	Status[1]	5/12 (A)	5/20 (B)	5/27 (C)	6/2 (D)	6/6 (E)	6/10 (F)	6/17 (G)	Frequency	Raw Mean[2]	Adjusted Mean[3]
Great Egret	*Casmerodius albus*	GREG	V		1	1					2	0.3	1.0
Snowy Egret	*Egretta thula*	SNEG	V							1	1	0.1	1.0
Mallard	*Anas platyrhynchos*	MALL	B	18	4	2			7		4	4.4	7.8
Cinnamon Teal	*Anas cyanoptera*	CITE	V	2	5						2	1.0	3.5
White-tailed Kite	*Elanus leucurus*	WTKI	V						3		1	0.4	3.0
Cooper's Hawk	*Accipiter cooperii*	COHA	V		1						1	0.1	1.0
Red-shouldered Hawk	*Buteo lineatus*	RSHA	B	1	1				1		3	0.4	1.0
Red-tailed Hawk	*Buteo jamaicensis*	RTHA	B	3	3	2	2	1		1	6	1.7	2.0
American Kestrel	*Falco sparverius*	AMKE	B	1	2		1			2	4	0.9	1.5
Virginia Rail	*Rallus limicola*	VIRA	T	1							1	0.1	1.0
Sora	*Porzana carolina*	SORA	B	1			2				2	0.4	1.5
Killdeer	*Charadrius vociferus*	KILL	V		1	2		1			3	0.6	1.3
Mourning Dove	*Zenaida macroura*	MODO	B	18	10	12	15	10	9	10	7	12.0	12.0
Anna's Hummingbird	*Calypte anna*	ANHU	B	6	6	5	2	3	2	2	7	3.7	3.7
Acorn Woodpecker	*Melanerpes formicivorus*	ACWO	V							2	1	0.3	2.0
Nuttall's Woodpecker	*Picoides nuttallii*	NUWO	B	4	4	2	4	4	5	4	7	3.9	3.9
Northern Flicker	*Colaptes cafer*	NOFL	B	1		1	1	1	3		5	1.0	1.4
Western Wood-pewee	*Contopus sordidulus*	WEWP	T	1							1	0.1	1.0
Willow Flycatcher	*Empidonax traillii*	WIFL	T				1				1	0.1	1.0
Black Phoebe	*Sayornis nigricans*	BLPH	B	9	6	7	7	14	17	6	7	9.4	9.4
Say's Phoebe	*Sayornis saya*	SAPH	V	1					2		2	0.4	1.5
Ash-throated Flycatcher	*Myiarchus cinerascens*	ATFL	B	4	1	4	9	2	2	6	7	4.0	4.0
Cassin's Kingbird	*Tyrannus vociferans*	CAKI	B	5		3	8	7	2	2	6	3.9	4.5
Western Kingbird	*Tyrannus verticalis*	WEKI	B	3	4	1	8	2	1	1	7	2.9	2.9

Table 3, continued			Status[1]	5/12 (A)	5/20 (B)	5/27 (C)	6/2 (D)	6/6 (E)	6/10 (F)	6/17 (G)	Frequency	Raw Mean[2]	Adjusted Mean[3]
Loggerhead Shrike	*Lanius ludovicianus*	LOSH	V						1		1	0.1	1.0
Warbling Vireo	*Vireo gilvus*	WAVI	T	2							1	0.3	2.0
Western Scrub-jay	*Aphelocoma californica*	WESJ	B	1	2	4	6	4	6	2	7	3.6	3.6
American Crow	*Corvus brachyrhynchos*	AMCR	B	3	2	4	4	4	8	3	7	4.0	4.0
Common Raven	*Corvus corax*	CORA	V				2				1	0.3	2.0
N. Rough-winged Swallow	*Stelgidopteryx serripennis*	NRWS	V	2	1						2	0.4	1.5
Oak Titmouse	*Baeolophus inornatus*	OATI	V							1	1	0.1	1.0
Bushtit	*Psaltriparus minimus*	BUSH	B	13	24	5	9	1	9	29	7	12.9	12.9
Bewick's Wren	*Thryomanes bewickii*	BEWR	V				2	1		1	3	0.6	1.3
House Wren	*Troglodytes aedon*	HOWR	B	2	6	5	13	5	6	9	7	6.6	6.6
Western Bluebird	*Sialia mexicana*	WEBL	V						4		1	0.6	4.0
Northern Mockingbird	*Mimus polyglottos*	NOMO	B	3	8	6	4	4	6	4	7	5.0	5.0
European Starling	*Sturnus vulgaris*	EUST	B	7	6	3	9	4	7	2	7	5.4	5.4
Yellow Warbler	*Dendroica petechia*	YWAR	B	7	1	1	1	2	2	2	7	2.3	2.3
Common Yellowthroat	*Geothlypis trichas*	COYE	B	3		3	8	7	3	7	6	4.4	5.2
Spotted Towhee	*Pipilo maculatus*	SPTO	B	2	2	4	8	9	12	3	7	5.7	5.7
California Towhee	*Pipilo crissalis*	CALT	B	9	4	2	9	9	14	12	7	8.4	8.4
Lark Sparrow	*Chondestes grammacus*	LASP	B	9	8	3	3	7	7	3	7	5.7	5.7
Grasshopper Sparrow	*Ammodramus savannarum*	GRSP	V					2	1		2	0.4	1.5
Song Sparrow	*Melospiza melodia*	SOSP	B	18	8	17	23	19	17	18	7	17.1	17.1
Black-headed Grosbeak	*Pheucticus melanocephalus*	BHGR	V				1				1	0.1	1.0
Blue Grosbeak	*Guiraca caerulea*	BLGR	B	4	7	6	14	8	11	8	7	8.3	8.3
Red-winged Blackbird	*Agelaius phoenicius*	RWBL	B	57	60	65	209	293	124	4	7	116.0	116.0
Western Meadowlark	*Sturnella neglecta*	WEME	V	2	3	3	2	2	1		6	1.9	2.2

Table 3, continued			Status[1]	5/12 (A)	5/20 (B)	5/27 (C)	6/2 (D)	6/6 (E)	6/10 (F)	6/17 (G)	Frequency	Raw Mean[2]	Adjusted Mean[3]
Brown-headed Cowbird	*Molothrus ater*	BHCO	B	4	1	12	5	8	3	2	7	5.0	5.0
Table 3, continued			**Status[1]**	**5/12 (A)**	**5/20 (B)**	**5/27 (C)**	**6/2 (D)**	**6/6 (E)**	**6/10 (F)**	**6/17 (G)**	**Frequency**	**Raw Mean[2]**	**Adjusted Mean[3]**
Hooded Oriole	*Icterus cucullatus*	HOOR	V		1						1	0.1	1.0
Bullock's Oriole	*Icterus galbula*	BUOR	B	3	8	3	4	4	5	3	7	4.3	4.3
House Finch	*Carpodacus mexicanus*	HOFI	B	29	24	26	37	21	30	39	7	29.4	29.4
Lesser Goldfinch	*Carduelis psaltria*	LEGO	V	3	1			1	2		4	1.0	1.8
American Goldfinch	*Carduelis tristis*	AMGO	V	1			2	1			3	0.6	1.3
House Sparrow	*Passer domesticus*	HOSP	B	3	1	1	1	2			5	1.1	1.6

[1] B = breeding species; V = visitor (see text); T = transient migrant
[2] Total / number of visits
[3] Total / frequency

Four-letter bird species codes used on the standard data form (Appendix A) are given in Table 3, as are the census date codes (A through G) that appear on the species summary maps.

The species summary map interpretation and analysis process was complicated by the high proportion of habitat edge on the study reach and by the varied breeding ecologies of the constituent bird species. Breeding-bird censuses conducted in most terrestrial habitats are optimally conducted on study plots with minimal edge (i.e., close to a perfect square configuration) and surrounded by expanses of similar habitat, so as to minimize the number of peripheral territories and to isolate habitat-specific avifauna from influences of other habitats (Bibby et al. 1992, Ralph et al. 1993). However, characteristically narrow, linear habitats such as riparian zones are inherently "edgy", which provides ample opportunity for use of the riparian zone by species from surrounding habitats and movement of riparian species into surrounding habitats. Nevertheless, edges of this kind are natural and some bird species are attracted to this condition.

The 3.4-mile Santa Maria Creek study reach occurs within a matrix of structurally dissimilar habitats, consisting primarily of grassland, but which includes rural human development and a small amount of coast live oak savannah. This results in the availability of approximately six miles of edge condition.

The complement of bird species breeding on the study reach ranges from species which only infrequently leave the confines of the riparian vegetation (e.g., song sparrow) to

those wide-ranging species of openly vegetated terrain that require only one or a few trees or comparable structures for nesting and perching (e.g., western kingbird). The breeding species on Santa Maria Creek actually form a continuum of affinity to riparian vegetation ranging from obligate to the "visitor" species from other habitats, as defined above. Considering this continuum, the distinction between peripheral breeders and visitors is somewhat arbitrary, although visitors in this study were distinguished as being clearly associated with non-riparian habitats and/or of low frequency and exhibiting poor spatial clustering within the riparian habitat. "Breeding" relative to riparian habitat in this study is defined as regular, spatially discrete use for one or more critical breeding-season functions (e.g., cover, nest placement, foraging). This determination for all species was made by considering frequency of occurrence (Table 3), clustering on summary maps, and behavioral clues. A potentially confounding factor is the range of mobility and scale of spatial use of the various species. Generally, smaller species (e.g., sparrows, warblers) utilize smaller areas, whereas large species (e.g., raptors, woodpeckers) are more wide-ranging, although exceptions occur.

As a result of the variability in the extent and nature of riparian habitat use by the range of 31 breeding species, one or both of two measures of breeding density were made for each species. Table 4 presents the species that exhibited consistent presence, spatial clustering, and which likely nested within or immediately adjacent to the riparian vegetation. Due to the inability of this study to truly delineate the breeding home ranges of most or all of the component breeding bird species and the likelihood that territories or home ranges are actually more extensive (i.e., occurring beyond the riparian habitat) than depicted on the summary maps, the numbers in Table 4 refer to "breeding territory cores". These are defined as the integral number of territories of a species that at least partially include riparian habitat on the study reach. Breeding territory cores were recorded arbitrarily as half (0.5) within a particular creek segment in cases where approximately equal proportions of a cluster occurred within two adjoining segments or in cases where evidence suggested that cores at either the west or east ends of the study reach were partially beyond the study boundaries.

Table 5 presents cumulative individual counts by creek segment as an alternative measure for those species whose distributions on the creek are typically non-clustered and do not appear to directly reflect breeding density. This group includes those that readily use riparian habitat, but require nesting substrate generally not available in that habitat, as well as species with certain mating systems, as discussed below. Due to the wide range of habitat structure on the study reach, some species fit into both categories, exhibiting clustered, breeding activity in some sections and scattered, sporadic occurrences in others. These species are evaluated in both tables.

Tables 4 and 5 also categorize the component species by the units that provide primary breeding clues to the observer. Although all bird reproduction implies male-female pairing, the species vary in their mating systems and in the degree of involvement that the sexes have in actual nesting.

Table 4. 2005 Santa Maria Creek breeding-bird census: species with densities based on mapped breeding territory cores.

Species	Breeding Map Unit	Land-Use Segments						Total Territ.[1]	Std. Density[2]
		A	B	C	D	E	F		
Mallard	young	0	0	0	0	1	0	1	2
Red-shouldered Hawk	pair/nest	0	0	0	0.5	0.5	0	1	2
Red-tailed Hawk	pair/nest	0	0	1	2	0	1	4	8
American Kestrel	pair	0	0.5	0.5	0	0	0.5	1.5	3
Sora	young	1	0	0	0	0	0	1	2
Mourning Dove	pair	0	0.5	2.5	1	0	0	4	8
Anna's Hummingbird	territ. male	0	0	1	0	3	0	4	8
Nuttall's Woodpecker	pair	0	0	0	3	0	1	4	8
Northern Flicker	pair	0	0	0	1	0	0	1	2
Ash-throated Flycatcher	pair	0.5	0	1	2	0	1	4.5	9
Cassin's Kingbird	pair	0	0	0	0.5	0.5	1	2	4
Western Kingbird	pair	0	0	0	0	0	1	1	2
Western Scrub-jay	pair	0	0	0	2	0	1	3	6
American Crow	pair	0	0	0	1	0	1	2	4
Bushtit	pair	0	0	1	1	0	1	3	6
House Wren	pair	0.5	0	0	4	0	1	5.5	11
Northern Mockingbird	pair	0	0	3	0	0	0	3	6
European Starling	pair	0	0	1	1	0	1	3	6
Yellow Warbler	pair	0	0	0	0	1	0	1	2
Common Yellowthroat	pair	4	0	0	0	1	0	5	10
Spotted Towhee	pair	0	0	0	4	0	0.5	4.5	9
California Towhee	pair	0	0	1.5	2.5	0	0	4	8
Lark Sparrow	pair	0	0	1	1	1	1	4	8
Song Sparrow	pair	0	1	1.5	8.5	3	2.5	16.5	33
Blue Grosbeak	pair	1	0.5	1.5	2	0	1	6	12
Bullock's Oriole	pair	0	0	1	1	1	1	4	8
House Finch	pair	0	0.5	2.5	4	2	1	10	20
House Sparrow	pair	0	0	0	0	0	1	1	2
TOTALS		7	3	20	42	14	18.5	104.5	209

[1] Territory cores = number of territories that include riparian habitat (see text).
[2] Standard density: number of breeding units per 100 acres of habitat.

Tables 4 and 5 indicate that most of the species are mapped and evaluated on the basis of observations of or relating to the monogamous male-female pair. Exceptions include: 1) Hummingbirds, whose sexes often occupy different breeding home ranges, often in different habitats, with the females performing all of the nesting tasks. The mapping of Anna's hummingbirds was based mostly on the presence of adult males, whose locations and numbers may not correlate directly with the locations and numbers of females (and therefore nests). 2) Birds of prey, which are monogamous and rely on both sexes for nesting, but are wide-ranging, often utilizing several different habitats. The interpretation of breeding presence of these species in an area is greatly enhanced by the location of the generally conspicuous nests and often by the presence of young. 3) Water birds, which often use watercourses solely for foraging, while nesting elsewhere. Location of nests or

subsequent presence of flightless young contributes strongly to conclusions of local nesting. 4) Colonial nesters, such as the red-winged blackbird, are often polygamous, so the best indicator of breeding density is the number of females, which is assumed to correlate directly with the number of nests. 5) Brood parasites, such as the brown-headed cowbird, are non-territorial with weak pair bonds since the females deposit eggs in the nests of host bird species. The number of females, each of which deposits eggs in one or more host nests, is the most direct indicator of reproduction.

Table 5. 2005 Santa Maria Creek breeding-bird census: species with densities based on cumulative individual map registrations.

Species	Breeding Map Unit	Land-Use Segments						Total Regis.
		A	B	C	D	E	F	
Mallard	young	10	4	2	0	15	0	31
Red-shouldered Hawk	pair/nest	0	0	0	3	1	0	4
Mourning Dove	pair	16	2	26	12	7	13	76
Anna's Hummingbird	territ. male	1	1	5	3	13	1	24
Black Phoebe	pair	6	2	5	12	21	10	56
Cassin's Kingbird	pair	1	0	1	6	4	11	23
Western Kingbird	pair	0	0	7	6	1	4	18
Western Scrub-jay	pair	0	0	2	19	0	4	25
Bushtit	pair	40	3	15	14	11	5	88
Red-winged Blackbird	female	40	0	0	0	0	0	40
Brown-headed Cowbird	female	1	0	0	7	1	4	13
TOTALS		115	12	63	82	74	52	398

The total density of all breeding birds on the study reach of Santa Maria Creek is approximately 158 units per 50 acres, as determined by composite count from Tables 4 and 5. This figure excludes only the Black Phoebe, which likely nests in non-riparian habitat and which could not be measured in terms of density due to its dispersion along the study reach. Therefore, the total breeding density is probably between 160 and 170 units per 50 acres.

The number of breeding territory cores for each species in Table 4 is transformed to the number per 100 acres of habitat, which is a standard for comparison among bird assemblages and over time within assemblages (Van Velzen 1972). In the case of the census reach of Santa Maria Creek, this transformation is tantamount to doubling the actual count, given the habitat area of approximately 50 acres. This standard transformation is typically done on the basis of the area of habitat, but due to the typically linear configuration of riparian habitat, the length of the reach may be a better unit of habitat measurement.

An internal validation of the numbers of breeding units for each species in Table 4 is provided by comparison with the adjusted mean total individual counts for those species in Table 3. These two numbers are roughly comparable for most species, suggesting that

on an average census day on which the species was detected, representatives of most or all of the breeding territories on the creek were encountered and recorded.

Qualitative Analysis and Discussion of the Santa Maria Creek Breeding Avifauna

It will be interesting to observe habitat affinity changes of riparian birds along Santa Maria Creek during future monitoring studies as the riparian corridor matures and improves as a result of grazing reduction and habitat recovery. Figure 3 shows the number of birds by habitat affinity occupying each creek segment (analyzed for each 1,000 feet per creek segment). With the exception of the marshy wetlands west of Rangeland Road that is dominated by marsh birds, all other habitats are dominated by generalists. Only the forested riparian segment within private property shows a relatively higher number of marsh and forest-associated birds than the overgrazed segments of the study area.

The simplest measure of avian diversity is species richness or the number of species occupying a defined area. The 2005 census of the 3.4-mile reach of Santa Maria Creek revealed 31 breeding species and is compared with other California breeding riparian bird censuses from the Journal of Field Ornithology and other sources in Table 6. Comparison with the other studies indicates that the present study falls within the range of species richness and standard breeding density.

Table 6. Comparison of the 2005 Santa Maria Creek Breeding-Bird Census with other comparable California studies. Studies are arranged from north to south.

Location	Year	Habitat	Plot Size (acres)	Number of Breeding Species	Standard Breeding Density[1]	Source
Cordelia, Solano County	1988	Alder-Maple forest with Bay and Oak	33.8	36	426	Lovio 1989
Fremont, Alameda County	1995	Willow riparian	20.0	22	290	Riensche et al. 1996
Livermore, Alameda County	1990	Sycamore woodland with Oaks	60.0	27	216	Cogswell 1991
Clovis, Fresno County	1949	Willow-Cottonwood woodland with Oaks	33.0	20	197	Ingles 1950
Fallbrook, San Diego County	1991	Willow riparian	28.9	31	626	Weaver 1992
Ramona, San Diego County	2005	Willow-Cottonwood forest with rip. scrub	52	31	317	Present study (unpublished)

[1] Standard density: number of breeding units per 100 acres of habitat.

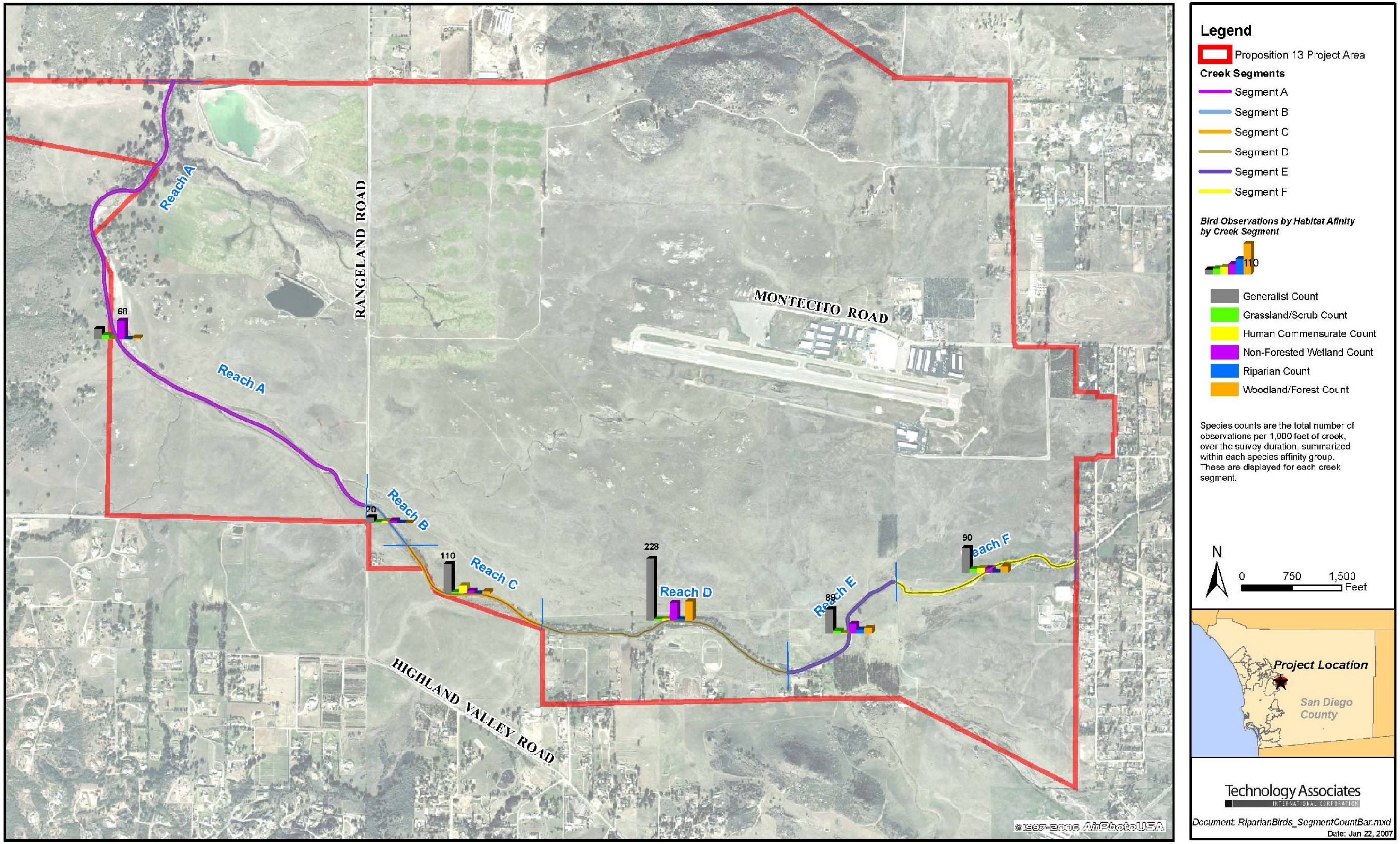

Figure 3: Summary of the Number of Bird Observations by Affinity Group in the Study Area

Beyond the simple measure of species richness, an evaluation of the integrity and completeness of an avian species assemblage requires an examination of the identities of the component species. One important measure is the proportion of the species that are obligates or specialists for the particular habitat type, relative to the proportion of habitat generalist species. Figure 4 shows relative species richness by habitat affinity calculated for 1,000 feet of area within each creek segment.

Table 7 indicates the ranges of affinities of the 31 breeding-bird species in this study to the various structural habitat types within the Santa Maria Valley. This categorization includes the spectrum of habitat types or features utilized to greater or lesser extents for various functions (nesting, foraging, perching, etc.) throughout the nesting cycle.
Using species characterizations from Table 7, Table 8 categorizes the 31 breeding species by habitat breadth and general habitat types.

Table 8 indicates that the breeding avifauna of Santa Maria Creek is composed mostly (16 species or 52%) of habitat generalists, including red-tailed hawk, American kestrel, mourning Dove, Anna's hummingbird, black phoebe, ash-throated flycatcher, Cassin's and western kingbirds, western scrub-jay, American crow, bushtit, spotted and California towhees, brown-headed cowbird, blue grosbeak, and house finch. Some of these habitat generalists use human-associated features as readily as native features and whose presence provides no indication of riparian habitat quality. Another three species (10%), northern mockingbird, European starling, and house sparrow (the latter two of which are non-native), are primarily associated with human habitations. Furthermore, the starling and sparrow are cavity nesters that compete with native species for nest sites. One species (3%), the lark sparrow, is typical of grassland or open scrub, but seeks edges of taller vegetation structure. Stated alternatively, approximately 65% of the breeding avifauna would probably occur in the Santa Maria Valley in the absence of riparian vegetation.

Five species (16%), red-shouldered hawk, Nuttall's woodpecker, northern flicker, house wren, and Bullock's oriole, are generally associated with woodland or forest, including non-native tree groves, and are not restricted to riparian forest.

Five species (16%), mallard, sora, common yellowthroat, song sparrow, and red-winged blackbird, are associated with non-forested wetlands, but only two of these (common yellowthroat and song sparrow) also typically occur within riparian forest canopy.

Only one (3%) of the component species, the yellow warbler, may be regarded as a riparian obligate species. This species does show limited affinity to non-native forests when adjacent to riparian systems and the single pair recorded in this study was partially associated with a large grove of eucalyptus trees immediately adjacent to creek segment E (Table 1).

Table 7. Affinities of Santa Maria Creek breeding bird species to basic habitat structural types in the Santa Maria Valley environs. X = major affinity; x = secondary affinity.

Species	General Habitat Structural Types							
	Grassland	Scrub	Marsh/Wetland	Undergrowth[1]	Forest/Woodland[2]	Riparian Forest	Human Structure	Human Vegetation
Mallard			X					
Red-shouldered Hawk					X	X		X
Red-tailed Hawk	X	X			X	X		X
American Kestrel	X	X			X	X	X	X
Sora			X					
Mourning Dove		X			X	X	x	X
Anna's Hummingbird		X			X	X		X
Nuttall's Woodpecker					X	X		x
Northern Flicker					X	X		X
Black Phoebe	x	x	X		x	X	X	X
Ash-throated Flycatcher	x	X			X	X	x	x
Cassin's Kingbird	X	X			X	x	x	X
Western Kingbird	X	X			x	X	x	X
Western Scrub-jay		X			X	x	X	X
American Crow					X	x	X	X
Bushtit		X			X	X		X
House Wren		x			X	X	X	x
Northern Mockingbird		x			x	x	X	X
European Starling	X	x			X	X	X	X
Yellow Warbler					x	X		x
Common Yellowthroat	x	x	X	X	x	X		
Spotted Towhee		X		X	X	X		
California Towhee		X		X	X	x	x	X
Lark Sparrow	X	x			x	x		
Song Sparrow	x	x	X	X	x	X		x
Red-winged Blackbird	x		X	X				
Brown-headed Cowbird	X	x			X	X		X
Blue Grosbeak	X	x	x			X		
Bullock's Oriole					X	X		X
House Finch	X	X			X	x	X	X
House Sparrow	x	x					X	X

[1] General low, dense vegetation within a forest or woodland canopy.
[2] General forest/woodland structure.

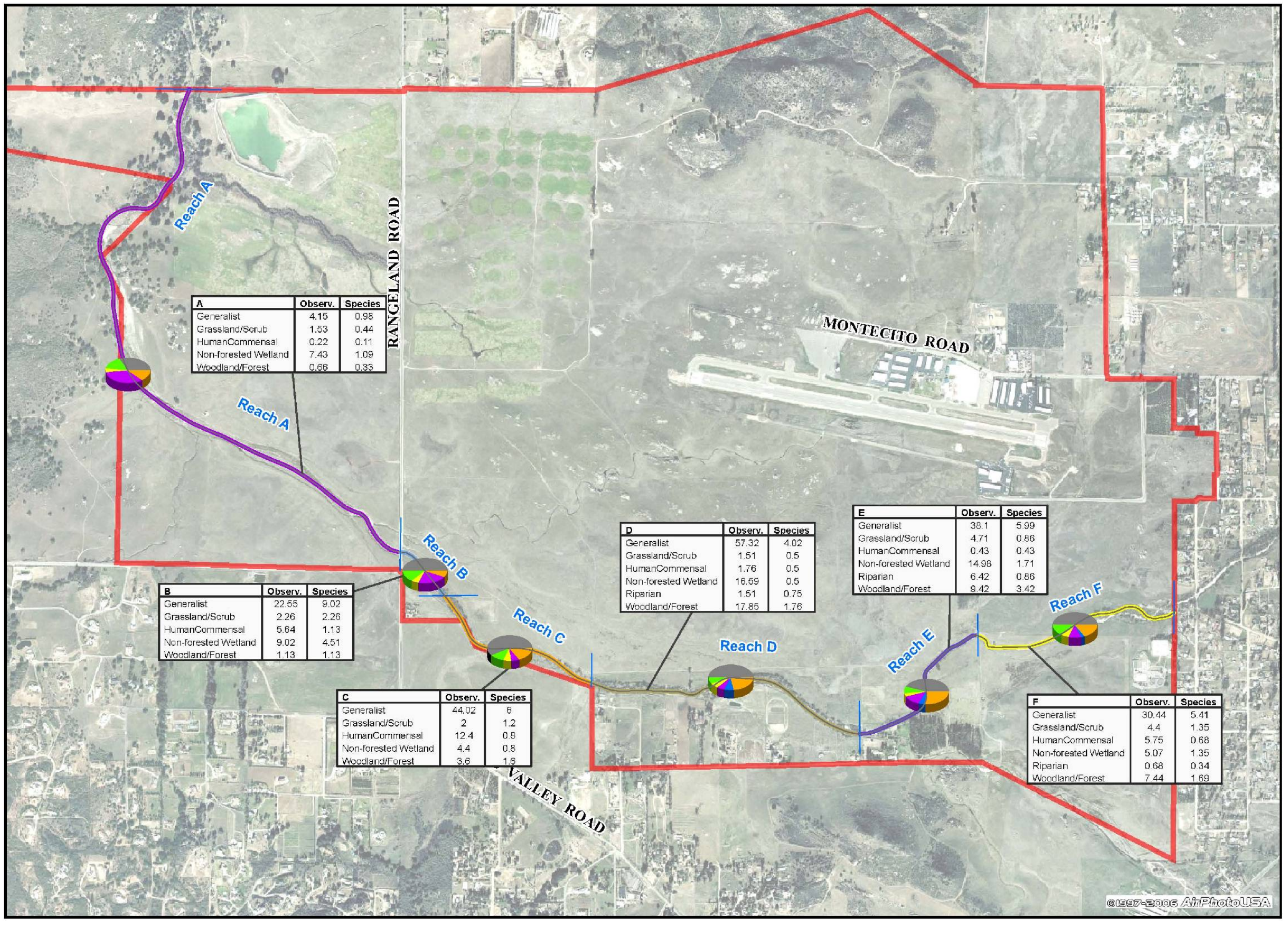

Figure 4: Summary of the Number of Riparian Bird Species by Affinity Group in the Study Area

Table 8. Categorization of the Santa Maria Creek breeding avifauna by degree and type of habitat specializations.

Habitat Affinity	Number of Species	Percentage
Human Commensal	3	10
Habitat Generalist	16	52
Non-Forested Wetland	5	16
Grassland / Scrub	1	3
General Woodland/Forest	5	16
Riparian Woodland/Forest	1	3

A number of riparian-associated or riparian obligate species would be expected, to varying degrees, to occur on at least some sections of Santa Maria Creek, considering its length, vegetation, elevation, and geographic location.
These species include:

- Green Heron (R)
- Cooper's Hawk (F)
- Black-chinned Hummingbird (R)
- Downy Woodpecker (R)
- Western Wood-pewee (F)
- Willow Flycatcher (R)
- Pacific Slope Flycatcher (F)
- Bell's Vireo (R)
- Hutton's Vireo (F)
- Tree Swallow (R)
- Bewick's Wren (G)
- Swainson's Thrush (R)
- American Robin (F)
- Orange-crowned Warbler (F)
- Yellow-breasted Chat (R)
- Black-headed Grosbeak (F)
- Lazuli Bunting (G)
- Hooded Oriole (F)
- Lesser Goldfinch (F)
- American Goldfinch (R)

As annotated, this list includes several riparian obligate (R) species, as well as general forest / woodland (F) species, and a few habitat generalists (G) that are of potential occurrence on the census reach, but were not found to be breeding in 2005. Some of these species did occur as visitors during the 2005 breeding-bird census (Table 3), but for unknown reasons were not persistent, despite the presence of suitable habitat.

Not all of the above species have equal probability of occurring on Santa Maria Creek, but should be watched for through monitoring associated with the restoration and recovery phase of the preserve. With habitat management, the distribution of bird species by habitat affinity may change; for example, with the discontinuation of grazing, riparian vegetation may establish, thereby providing more habitat for forest/woodland species and riparian obligates.

A number of sensitive or listed riparian bird species were marginally associated with the Santa Maria Creek study reach.

The Cooper's hawk was represented by an observation of one bird on 20 May (Table3). This forest-nesting species is considered sensitive in San Diego County and likely nested in riparian or non-native forest in the vicinity of the study reach in 2005. Future nesting occurrence of this species in mature forest, such as that in creek segment D, is probable.

One singing willow flycatcher was found in dense forest in creek segment D on 2 June, but this species was not detected on subsequent visits. The riparian vegetation on this segment appears to be suitable for this federally endangered species in terms of structure and extent. However, the bird detected may have been of one of the sub-species that only migrates through San Diego County. The endangered subspecies (*E. t. extimus*) is of possible occurrence along Santa Maria Creek.

The western bluebird, a Covered Species under the City of San Diego's Multiple Species Conservation Planning program, was represented by one record of four birds, including young, on 10 June, 2005. This cavity-nesting species may find suitable habitat in the forested sections of Santa Maria Creek, but is more likely to occur in the oak savannah west of the study reach.

One pair of yellow warbler occurred on the study reach and is discussed above. A higher density of this species, particularly in creek segment D, would be expected.

Conclusions

The section of Santa Maria Creek through Santa Maria Valley, by virtue of its size, natural setting, and natural hydrology provides great potential for supporting significant population segments of several riparian bird species that can serve to bolster regional populations. The largely undeveloped landscape of the Santa Maria Valley comprises several important natural communities, which, in juxtaposition form a rich preserve as a consequence of the high beta-diversity among its component elements. Such complexity of habitat types preserves not only species richness, but a richness of ecotones.

Despite the potential of the area, the current breeding riparian avifauna appears to be depauperate in terms of obligate species. Habitat generalists dominate the avifauna, suggesting an historic degradation of riparian values from anthropogenic activities. The absence of certain species is puzzling, as sections of apparently suitable habitat are

available. The paucity of riparian obligate species in the presence of habitat suggests a fairly recent and only partial recovery of conditions, coupled with lag effects associated with avian colonization from distant source populations. The enhancement of the area for riparian obligate species will likely not result in the loss of habitat generalists, but rather in an increase in diversity. Continued monitoring will reveal whether any habitat changes are accompanied by increases in bird diversity.

Future Monitoring and Management Recommendations

As highly mobile organisms, birds shift spatially among years on generally larger scales than encompassed by individual studies. These shifts may be attributable to local population factors such as survivorship and recruitment or to larger-scale (regional or continental) factors and may not be reflective of local habitat conditions. Because of this natural year-to-year variability in the composition of avifauna and in the relative abundances of component species within bounded areas, several, preferably consecutive years of study are required to allow the differentiation of short-term fluctuations from actual population trends. This position forms the basis for the following monitoring and management recommendations.

Monitoring

- An initial monitoring scheme of three to five consecutive years is recommended during the period of relatively static habitat conditions (prior to significant natural recovery and/or active restoration). As the range of variability is revealed, longer intervals (two to five years) may be implemented.
- The spot-mapping method described herein would be preferable for determining an accurate baseline due to its direct census and direct spatial correlations with habitat features.
    - Due to length of the study reach (3.4 miles) and amount of time required for a complete census pass (eight to ten hours), it is recommended that future efforts divide the reach into halves to be covered either simultaneously by two observers or on consecutive days by one observer. The approximate time for survey of one half of the reach would be six hours, which would allow the collection of more detailed data.
    - Future census efforts should begin earlier in the season than mid-May, as this date is relatively late in the nesting phase for most species. An initiation date in early April is recommended.
    - Future census efforts should provide for eight to ten census visits extending into early June to include the fledging period of most species and to provide comparability with the 2005 data.
- Conduct at least two night survey visits to determine the nocturnal avifauna.
- An alternative survey method to spot-mapping would be fixed point-count surveys, which require significantly less effort, but provide only an index of abundance, sample rather than completely census the study area, and do not

provide unambiguous information on habitat relationships in areas of high habitat edge.
    - Point-count schemes must address the issue of independence of sampling stations and adequate sample size.
    - Although not directly comparable with spot-mapping data (maps), fixed or variable radius point-count sampling schemes may be superimposed on baseline maps of species' distributions for comparison.
    - Under budget constraints, a more frequent point-counting sampling design may be alternated at longer intervals with spot-mapping for verification and comparability with the baseline.
- Regardless of survey method, bird monitoring should at least be qualitatively comprehensive (i.e., should record all species in the area) so as to detect even the sporadic occurrences of species on the above "watch list" that may other wise escape detection by the sampling scheme.
- Continue regular monitoring of habitat elements of importance to birds (e.g., vegetation density, canopy closure, undergrowth) in conjunction with bird surveys, particularly during periods of rapid natural recovery, perturbation (e.g. flood scouring), or active restoration.
- Provide a detailed aerial photograph-based map of vegetation composition and structure, as well as other habitat features, upon which to superimpose bird data. Update this map at intervals of two to five years, depending on the rate of habitat change.
- Formulate a survey and monitoring scheme for grassland birds since the Santa Maria Valley appears to support significant population segments of several restricted species in San Diego County.

Management

- Maintain suitable hydrology in future years to sustain riparian vegetation.
- Remove, reduce, or restrict cattle grazing from sections of the creek (e.g., segments C, E, and F) to allow regeneration and maturation of forest and development of understory.
- Augment the area of mature riparian forest on segment D through active or passive restoration on adjoining segments.
- Ensure the development and persistence of native overstory and understory vegetation elements through a combination of planting and weed control, especially in recovering areas.
- Maintain or enhance the large-scale biodiversity of Santa Maria Creek by maintaining some degree of open marshy vegetation on the section west of Rangeland Road to benefit red-winged blackbird colonies and arroyo toad.
- Maintain existing and establish new snags to ensure the availability of nesting substrate for cavity-nesting birds.

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